

90-04-05-004

# RECOVERY PLAN

## *Arkansas Fatmucket Mussel*

U.S. Fish and Wildlife Service



Arkansas Fatmucket Mussel

(Lampsilis powelli)

Recovery Plan

Prepared by


James H. Stewart  
U.S. Fish and Wildlife Service  
Jackson, Mississippi

for

Southeast Region  
U.S. Fish and Wildlife Service  
Atlanta, Georgia

Approved:

**Acting**

  
Regional Director, U.S. Fish and Wildlife Service

Date:

February 10, 1992

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the listed species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives will only be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service, involved in the plan formulation. They represent the official position of the U.S. Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species' status, and the completion of recovery tasks.

Literature citation should read as follows:

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## EXECUTIVE SUMMARY

Current Species Status: This freshwater mussel is listed as threatened and is known to exist in the headwaters of the Saline River, and in the Caddo, Ouachita, and South Fork Ouachita Rivers of central Arkansas.

Habitat Requirements and Limiting Factors: Major threats to its continued existence are impoundments, channel alteration, gravel dredging, sedimentation, and water quality degradation. It seems to prefer deep pools and backwater areas that possess sand, sand-gravel, sand-cobble or sand-rock with sufficient flow to periodically remove organic detritus, leaves and other debris. It is not generally found in riffles nor does it occur in impoundments. It is frequently found adjacent to islands of Justicia americana (water willow), where substratum is typically depositional and water depth is about 1 meter (Harris and Gordon 1988).

Recovery Objective: Delisting.

Recovery Criteria: This species may be considered for delisting when: (1) there are viable populations in the Ouachita and South Fork Ouachita Rivers; in the Alum, Middle, and North Forks of the Saline River; and, in the mainstem Saline River, (2) the habitat for all these populations is fully protected, and (3) viable populations are maintained for a period of at least 20 years.

### Actions Needed:

1. Protect the known populations and their habitats from further impacts.
2. Conduct life history research on the species.
3. Investigate restoration of historic habitat and restore species.
4. Develop and implement plan to monitor all populations.

Total Estimated Cost of Recovery: It is not possible to determine costs beyond the first few years. Cost estimates for tasks to be conducted over the next 3 years total \$528,000.

Date of Recovery: Recovery of this species is estimated to take at least 20 years after the additional populations have been located or reestablished. It is not possible to estimate the time necessary to conduct the various required studies, even if all the funding were immediately available.

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## PART I: INTRODUCTION

This freshwater mussel is known to exist in the headwaters of the Saline River, and in the Caddo, Ouachita, and South Fork Ouachita Rivers of central Arkansas. Major threats to its continued existence are impoundments, channel alteration, gravel dredging, sedimentation, and water quality degradation. The historic range has been reduced by the construction and impoundment of Lakes Ouachita, Hamilton, and Catherine; DeGray Reservoir; and the resulting hypolimnetic water releases. The Arkansas fatmucket was listed as threatened in the Federal Register on April 5, 1990 (U.S. Fish and Wildlife Service 1990).

### Description

The Arkansas fatmucket was described as Unio powelli by Lea in 1852 from the Saline River, Arkansas (Johnson 1980). It was synonymized under Actinonaias ligamentina by Call in 1895 (Harris and Gordon 1988). In 1900, Simpson placed it in the genus Lampsilis (Simpson 1914). The species has been overlooked by a number of authors in reviews of Arkansas mussel fauna, including Burch (1975), Gordon et al. (1980), and Gordon (1980). Johnson (1980), Stansbery (1983), and Gordon and Harris (1985), all consider L. powelli a valid species. Reported collections of L. powelli from the Spring and Neosho Rivers, Kansas, and the Black River, Missouri, are misidentifications.

The shell of the Arkansas fatmucket is generally of medium size, but it occasionally exceeds 100 millimeters (4 inches) in length. It is elliptical to long obovate with subinflated valves. The umbos are moderately full and project slightly above the hinge line. The shell surface is generally smooth with a shiny olive brown to tawny periostracum and lacks rays. There are lines of tiny pits running down the shell that sometimes appear to be rays (Harris and Gordon 1990). The nacre is bluish white and iridescent. Both pseudocardinal and lateral teeth are thin but well developed. There is sexual dimorphism in the shape of the shell (Johnson 1980). The shell of males is pointed posteriorly and that of females is rounded.

### Distribution

The Arkansas fatmucket is known to exist in the Ouachita, Saline, and Caddo River systems (Figures 1-3). In the Ouachita Basin, this species occurs in the Ouachita River upstream of Lake Ouachita in Montgomery and Polk Counties, and in the South Fork Ouachita River, upstream of Lake Ouachita in Montgomery County. In the Saline River Basin, the species occurs in Alum Fork, the Middle Fork, and the North Fork above their confluence with the Saline River, and in the Saline River from its formation downstream to about the Fall Line. The species does not occur in the South Fork of the Saline River or in Hurricane Creek, a major tributary, but it probably did historically. In the Caddo River, the Arkansas fatmucket is known from three locations, all of which are in the mainstem.

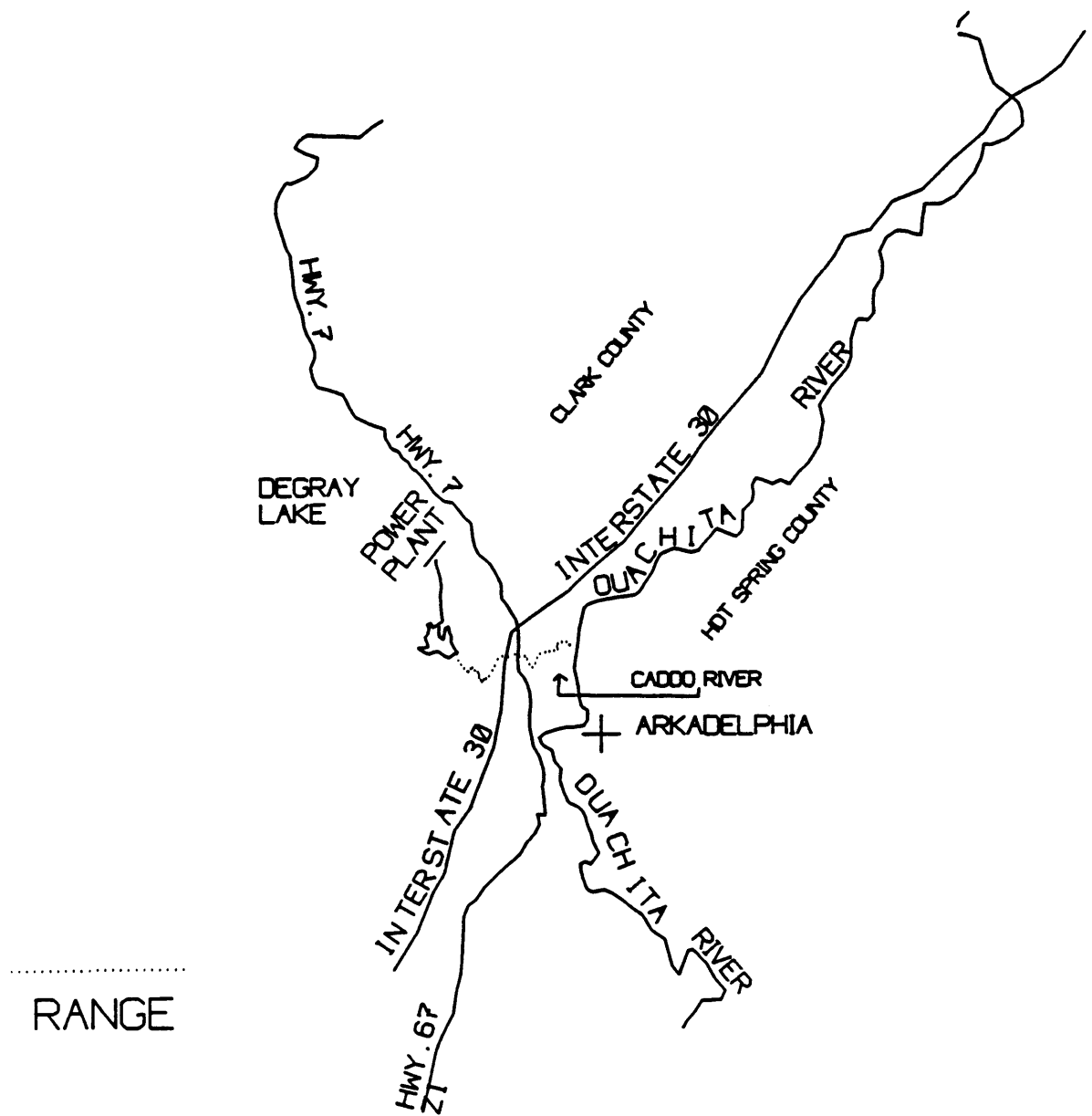


Figure 1. Current range of Arkansas fatmucket

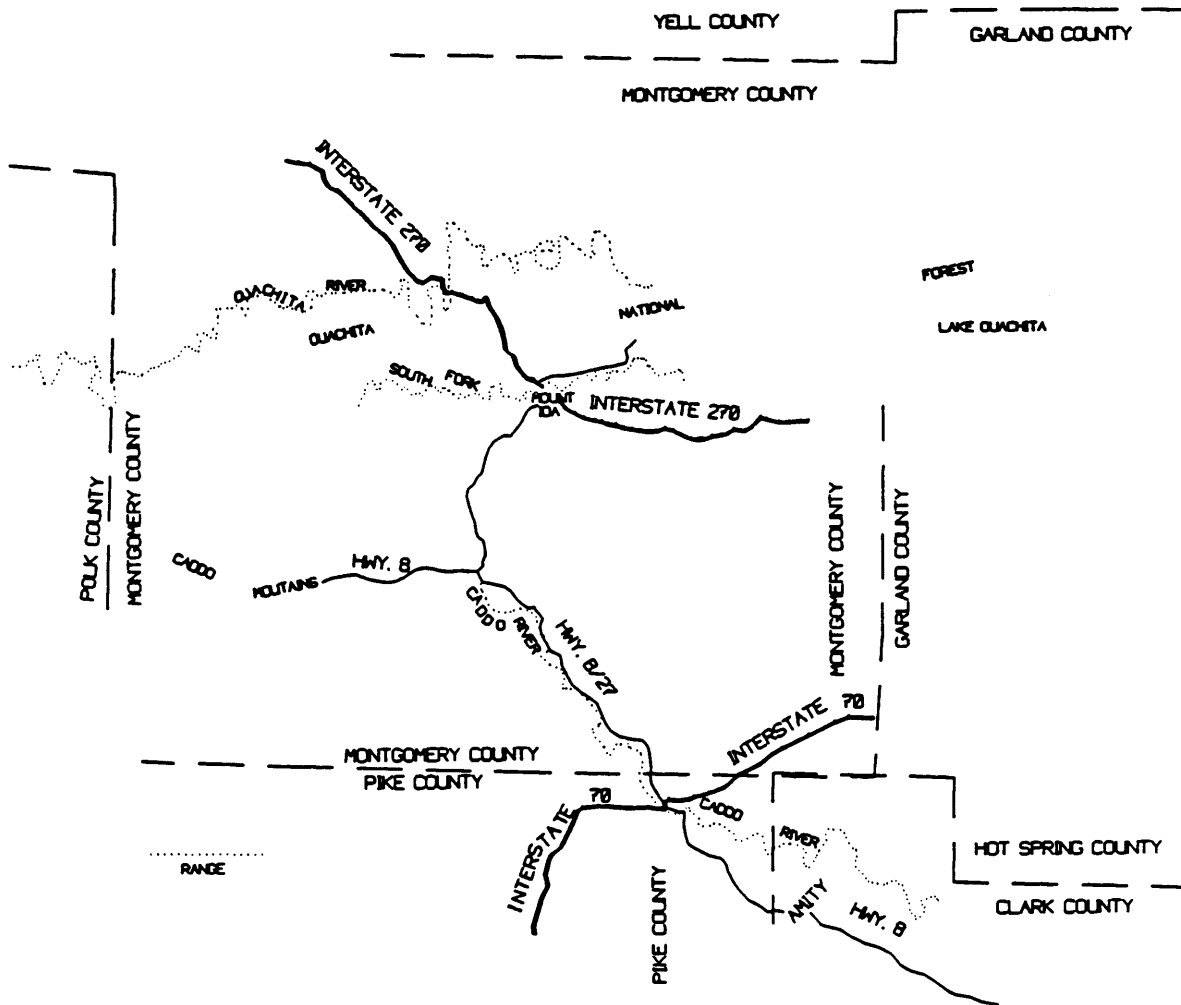


Figure 2. Current range of Arkansas fatmucket



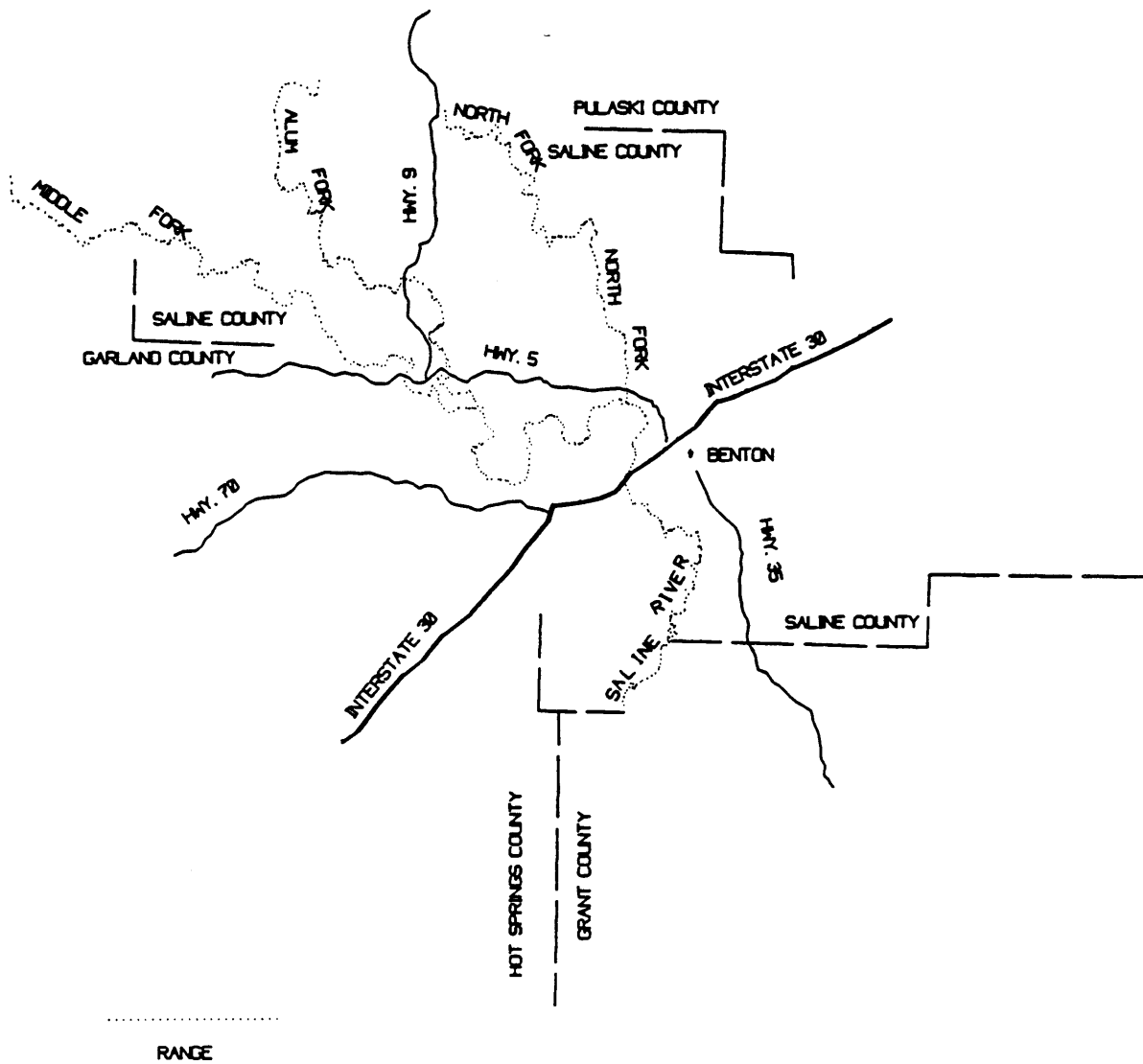


Figure 3. Current range of Arkansas fatmucket

Collection records, on which to base historical distribution of this species, do not exist. However, some assumptions can be made by examining the current distribution, current habitat types, and alterations to habitat that have occurred for various reasons. The historic range of this species likely included the Caddo River from Norman downstream to the Ouachita River, including at least the lower reach of the South Fork Caddo River. It seems likely that the species occupied the Ouachita River from Malvern upstream to the species' current known range, and the South Fork Ouachita River for its entire length. In the Saline River drainage, the Arkansas fatmucket likely occurred in all four forks and the mainstem from the Fall Line upstream to the extent of permanent flowing water, and in Hurricane Creek upstream of the Fall Line. Archeological records of other Ozarkian mussels indicate these species may have historically occurred throughout the entire drainage of those systems rather than being restricted to the headwaters as they are at present.

### Life History/Ecology

The Arkansas fatmucket prefers deep pools and backwater areas that possess sand, sand-gravel, sand-cobble, or sand-rock with sufficient flow to periodically remove organic detritus, leaves, and other debris. It is not generally found in riffles nor does it occur in impoundments. It is frequently found adjacent to islands of Justicia americana (water willow) where substrate is typically depositional and water depth is about 1 meter (3.2 feet) (Harris and Gordon 1988). The life history is presumed to be similar to that of other unionids. During the spawning period, males discharge sperm into the water and females collect the sperm by the siphoning process. Eggs are fertilized and held in the females gills where they develop into larvae or glochidia. The glochidia are discharged into the water where they attach to a fish host, become encysted, and metamorphose into juvenile mussels that are capable of surviving if they fall to suitable substrate. Gravid females have been observed in January, February, and April (Harris and Gordon 1990). Mussels are also dependent upon the water currents to bring food particles within the range of their siphons. Members of the genus Lampsilis have a very distinctive mantle flap that resembles a small minnow. It usually has a pigment spot and several triangular processes providing a flaring appearance. This unique mantle is apparently used to entice fish close enough for the glochidia to attach.

### Reasons for Listing

The range of the Arkansas fatmucket has been curtailed and continues to be threatened by impoundments, channel alteration, gravel dredging, sedimentation, and water quality degradation. In the Ouachita River, the range has been reduced by the construction of Lakes Ouachita, Hamilton, and Catherine and the hypolimnetic water releases from these impoundments. In the Caddo River, the impoundment of DeGray Reservoir and resulting hypolimnetic water releases have impacted what was probably the uppermost historic habitat for the species in this system. A part of the Ouachita River Basin Comprehensive Study by the U.S. Army Corps of Engineers includes

a feasibility study for one or more impoundments for flood control and other purposes on the Saline River near Benton (Harris and Gordon 1988). The Soil Conservation Service has constructed one impoundment on a tributary of the South Fork Ouachita River, has another under construction, and plans a third impoundment on the mainstem South Fork Ouachita River (Harris and Gordon 1988). While these Soil Conservation Service impoundments will not directly inundate known populations of this species, there are impacts occurring during the construction and possibly during the operation of these impoundments. During construction, there is increased threat from silt and sediment, and after completion, the control of water flows during low flow periods could expose the mussel and also result in lowered dissolved oxygen. This is of particular concern relative to construction of the third reservoir on the South Fork Ouachita River. This reservoir is only a short distance upstream of the Arkansas fatmucket populations in this stream. The impacts of construction and possibly operation could result in the loss of the South Fork Ouachita River population. If so, the only remaining good populations would be in the Saline River drainage and such may warrant this species being reclassified as endangered. Harris and Gordon (1988) list 16 existing impoundments (plus one under construction and one planned) within the known range of this mussel that undoubtedly have already impacted its existence, or will in the future.

In the South Fork Ouachita River, there is evidence of adverse impacts to a population of the Arkansas fatmucket from channel alteration as a result of highway repairs occurring in 1984-1985. The existing channel is filling with organic debris, and flows are apparently inadequate to flush the area. Channel modification is common at highway crossings, and habitat for this species undoubtedly has been impacted by the many road crossings within its range.

Small gravel operations are common within the range of the Arkansas fatmucket and many streams are impacted by the removal of preferred substrate and by the resulting downstream sedimentation. The Saline River downstream of Benton has been severely impacted by gravel dredging (Harris and Gordon 1988).

Water quality degradation apparently is responsible for the absence of the Arkansas fatmucket from a significant area within the species' probable historic range. The South Fork Caddo River receives runoff from a barite mining operation. Prairie Creek, a tributary of the Ouachita River, receives improperly treated municipal waste (Harris and Gordon 1988). Hurricane Creek and Lost Creek of the Saline River drainage receive acid mine runoff from bauxite mines. Additionally, non-point source pollution occurs in varying degrees from feedlot runoff, timber harvest, road construction, and fertilization for agriculture in all three river basins where this species is found.

Existing habitat in the Ouachita River may be less than satisfactory for this species. In a 1987-1988 survey of the mainstem Ouachita River, involving some 54 river miles of potential habitat, only five individuals of

the Arkansas fatmucket were collected (Harris and Gordon 1988). The Caddo River stream gradient upstream of DeGray Reservoir is rather precipitous resulting in swift water flows, particularly during storm events. This results in considerable shifting of the stream bed making that habitat marginal for the Arkansas fatmucket and placing any individuals of a remaining population in the upper Caddo River in jeopardy. The only known population in the Caddo River is below DeGray Reservoir and may be impacted by hypolimnetic water releases from that impoundment. Habitat below DeGray Reservoir is limited in extent.

### Conservation Measures

The U.S. Forest Service funded a study to further define the range of the Arkansas fatmucket within lands under their jurisdiction (Brown and Brown 1989). Surveys have been conducted at specific project sites on the Caddo River (Harris 1989) and in the Saline River drainage (Harris in litt., 1989). The population known to occur in the Caddo River below DeGray Reservoir was extant. The area surveyed in the Saline River drainage was not known to support this species and no individuals were located. Brown and Brown (1989) found numerous dead shells in the South Fork of the Ouachita River that were identified as Lampsilis powelli, indicating this population was in peril. A more recent survey by Harris (pers. comm. 1990) and examination of the voucher specimens from the Brown and Brown survey, by individuals with expertise in mussel taxonomy, indicate that the species is not as endangered as indicated by Brown and Brown (1989). Many of the dead shells collected by Brown and Brown as Lampsilis powelli, and left as vouchers with the U.S. Forest Service, were misidentified. These shells have been placed in the Arkansas State University Museum, Jonesboro, Arkansas. Both surveys (Brown and Brown 1989, Harris per. comm. 1990) identified some increased siltation due to construction of Soil Conservation Service projects on tributaries of the South Fork.

## PART II: RECOVERY

### A. Objective

The objective of this plan is to recover and delist the Arkansas fatmucket mussel, Lampsilis powelli. This species may be considered for delisting when: (1) there are viable populations in the Ouachita, and South Fork Ouachita Rivers, in the Alum, Middle, and North Forks of the Saline River, and in the mainstem Saline River; (2) when the habitat for all these populations is fully protected; and, (3) viable populations are maintained for a period of at least 20 years.

"Fully protected" is defined as the implementation of protective measures, such as land management standards and guidelines for mussel habitat management, to ensure populations of this species remain at or greater than the levels required for a viable population. Protection will extend into the watershed, including public and private lands, to the point where activities in the watershed no longer negatively affect the stream.

A viable population is defined as a population with the reproductive capability to sustain itself without immigration of individuals from other populations.

Due to the lack of information on the life history of the species, it is not possible to estimate the time needed to conduct the various studies relating to recovery. Thus, at this time, it is not possible to estimate a date for recovery of this species.

### B. Narrative Outline for Recovery Actions Addressing Threats

1. Protect the known populations and their habitats from further impacts. The best populations occur in the South Fork Ouachita River and in Alum and Middle Fork of the Saline River. It is imperative these populations be protected to prevent the species from becoming endangered. The remaining populations must be protected if the species is to recover. The Caddo River population is not included because impacts from hypolimnetic water discharges from DeGray Reservoir likely create an inhospitable environment for the Arkansas fatmucket.
  - 1.1 Use existing legislation to protect the range of known populations. Adverse impacts continue to reduce the range of this species. Existing Federal and State legislation can be used to monitor known populations and take corrective actions as warranted. In cases where there is no applicable legislation, the action agency should be urged to voluntarily protect the habitat of this species. Populations of this species continue to be adversely impacted and must be protected

to prevent further declines that would warrant endangered status.

- 1.2 Develop and implement a management plan to protect the habitat. A plan to manage the habitat of the known populations should be developed and implemented. Since some or all of these populations are directly affected by the U.S. Army Corps of Engineers and the Soil Conservation Service, it will be important to attain their input to, and cooperation in, the development and implementation of such a plan. The plan should consider ways to protect the existing populations, and restore or improve habitat within these existing populations, so that individual mussels become more numerous. This plan should include information from life history studies and protection of the fish host(s) and its ecosystem (Task 2). Specific tasks and methodology will be determined during plan formulation.
2. Conduct life history research on the species. While protecting adult mussels and the known habitats is of utmost importance, it is equally important that we know the life history requirements of the species if we are to ensure survival and recovery. This task should determine fish host(s), preferred habitats, water quality requirements, and other life history parameters. Survival is dependent upon protection of all aspects of the life history. For example, loss of the fish host(s) means loss of the mussel.
  - 2.1 Characterize habitat. In order to restore this species to former habitat, we need to determine habitat characteristics for current populations. This would provide a standard by which other habitat could be compared.
  - 2.2 Determine associated fish and mussel species. Mussel and fish species that are associated with Lampsilis powelli can be indicators of suitable habitat. A determination of associated species will be considered. This should also provide information on potential fish host(s).
  - 2.3 Develop life history data. Research to determine gametogenesis, fish host identification, age class structure, growth rate, life tables, and mortality factors will be considered. Without this information, all efforts to recover this species, especially by artificial propagation, may be futile. This information will be beneficial in evaluating recovery of the species.
3. Determine the feasibility of restoring historic habitat and reestablishing the species. This species existed in the Ouachita, Saline, and Caddo Rivers and their major headwater streams. To ensure recovery of this species, it may be necessary that

populations be discovered or reestablished in areas of the historic range.

- 3.1 Develop a plan to restore historic habitat. Populations of the Arkansas fatmucket continue to exist in the Ouachita River and the South Fork Ouachita River upstream of Lake Ouachita and in the Saline River and its headwater streams. The limited population in the Caddo River is likely in an irreversible situation and is not addressed in this task. This task will consider development of a plan to restore historic habitat to a condition that would allow recolonization or reestablishment of the species. Suggested priority areas are the Ouachita River and the North Fork and mainstem of the Saline River, since these appear to be the less viable populations. A second phase in the plan should focus on populations in the South Fork Ouachita River and Alum and Middle Forks of the Saline River. The plan should include a determination of the water quality and habitat types where this species is still abundant, to be used as a guide in restoring habitat in areas where it is less abundant.
- 3.2 Develop a plan for reestablishing mussel populations. A plan for reestablishing mussel populations should be developed. This plan should include, but not be limited to: determining the suitability of restored habitat by relocating and monitoring closely related species; determining the feasibility of reestablishing Lampsilis powelli by artificial culture and/or by transplanting from the larger populations; and methods of marking introduced individuals for survival determinations.
- 3.3 Implement plan to restore historic habitat. Based upon information gained in Tasks 3.1 and 3.2, restoration of historic habitat may be considered.
- 3.4 Implement plan to reestablish the Arkansas fatmucket in historic habitat. Based upon the information gained from Tasks 2.0, 3.1, and 3.2, the feasibility of reintroducing this species may be considered. If feasible, mussels should be reintroduced into restored habitat using methods in accord with the plan developed in Task 3.2.
4. Develop and implement a plan to monitor all populations. A plan to determine minimum population levels should be developed and implemented. This plan should be the basis for determining when individuals can be removed from the existing populations and when the species has reached a level at which it may be delisted. All populations should be monitored for a period of at least 20 years after they have attained the minimum population level developed by this task.

- 4.1 Determine minimum population levels. Some minimum number of individuals is required for a self-sustaining population. A minimum of 500 individual mussels has been suggested in other recovery plans. This task will determine the minimum number of individuals required for a self-sustaining population.
- 4.2 Develop a plan to monitor populations that have attained the minimum viable population level. This plan should include the minimum number of adults required in a self-sustaining population and the size classes required as evidence of sufficient recruitment. The frequency and method of monitoring over the 20-year period will be developed.
- 4.3 Implement the monitoring plan. The monitoring should be accomplished according to the plan developed in Task 4.2. All monitoring should be under the close supervision of someone with demonstrated expertise with freshwater mussels.

C. Literature Cited

- Brown, A.V., and K.B. Brown. 1989. Stream inventory of Lampsilis powelli populations on national forest lands. A report to U.S. Dept. of Agriculture. 28 pp. + appendices.
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- Stansbery, D.H. 1983. Some sources of nomenclatural and systematic problems in unionid mussels. Pp. 46-62 In A.C. Miller, compiler. Report of freshwater mussels workshop, 26-27 October 1982. U.S. Army Engineer Waterways Experiment Station, Environmental Laboratory, Vicksburg, MS.
- U.S. Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; threatened status determined for the Arkansas fatmucket, Lampsilis powelli. Federal Register 55(66):12797-12801.

### PART III: IMPLEMENTATION SCHEDULE

Priorities in column one of the following implementation schedule are assigned as follows:

1. Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
2. Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.
3. Priority 3 - All other actions necessary to meet the recovery objective.

#### Key to Acronyms Used in Implementation Schedule

FWE - Fish and Wildlife Enhancement, U.S. Fish and Wildlife Service  
RES - Division of Research, U.S. Fish and Wildlife Service  
EPA - Environmental Protection Agency  
ARGF - Arkansas Game and Fish Commission  
COE - U.S. Army Corps of Engineers  
ARPCE - Arkansas Department of Pollution Control and Ecology  
ECE - Environmental Contaminants Evaluation, U.S. Fish and Wildlife Service  
USFS - U.S. Forest Service

IMPLEMENTATION SCHEDULE											
PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION	RESPONSIBLE PARTY			Other	COST ESTIMATES (\$K)			COMMENTS/NOTES *
				USFWS	Division	Region		FY 1	FY 2	FY 3	
1	1.1	Use legislation to protect habitat	continuous	4	FWE	ARPCE COE ARGF EPA USFS		5	5	5	
2	1.2	Develop and implement plan to protect habitat	continuous	4	FWE RES	ARGF COE ARPCE USFS		6	6	6	
2	2.1	Characterize habitat	1 year	4	FWE RES	ARGF COE USFS		10			
3	2.2	Determine associate species	1 year	4	FWE RES	ARGF COE USFS		10			
2	2.3	Develop life history data	3 years	4	FWE RES	ARGF COE USFS		100	100	100	
3	3.1	Develop plan to restore historic habitat	1 year	4	FWE RES ECE	ARGF ARPCE COE USFS		100			
3	3.2	Develop plan for reestablishing mussel populations	5 years	4	FWE RES	ARGF COE USFS		50	50	50	
3	3.3	Implement plan to restore historic habitat	To be determined	4	FWE RES	ARGF COE USFS					Costs will be determined during completion of earlier tasks.
3	3.4	Implement plan to reestablish populations in historic habitat	To be determined	4	FWE RES	ARGF COE USFS					Costs will be determined during completion of earlier tasks.

[illegible]

## Part IV: APPENDIX

### List of Reviewers

Dr. Arthur E. Bogan  
Academy of Natural Science  
19th and the Parkway  
Philadelphia, PA 19103

Dr. David H. Stansbery  
Ohio State University  
1813 N. High Street  
Columbus, OH 43210

Mr. Harold Grimmett  
Arkansas Natural Heritage Commission  
225 East Markham, Suite 200  
Little Rock, AR 72201

Dr. John Harris  
12301 Pleasant Forest Drive  
Little Rock, AR 72212

Dr. Arthur H. Clarke  
ECOSEARCH, Inc.  
325 E. Bayview  
Portland, TX 78374

Mr. Steven Ahlstedt  
Tennessee Valley Authority  
Office of Natural Resources  
Norris, TN 37828

Mr. Richard Biggins  
U.S. Fish and Wildlife Service  
330 Ridgefield Court  
Asheville, NC 28806

Dr. Richard Neves  
VA Cooperative Research Unit  
Virginia Tech University  
Blacksburg, VA 24061

Mr. Leroy M. Koch  
Missouri Department of Conservation  
323 S. Main Street  
Palmyra, MO 64561

Dr. James Williams  
National Fishery Research Center  
7920 NW 71st Street  
Gainesville, FL 32606

Mr. Mark Bosch  
U.S. Forest Service  
Wildlife, Fisheries, and Range  
1720 Peachtree Street  
Atlanta, GA 30367

Dr. Mark Gordon  
TN Cooperative Research Unit  
Tennessee Tech University  
P. O. Box 5114  
Cookeville, TN 38505

Mr. Rex Roberg  
Arkansas Game and Fish Commission  
#2 Natural Resources Drive  
Little Rock, AR 72205

Arkansas Highway and Transportation Dept.  
P. O. Box 2261  
Little Rock, AR 72203

Arkansas Dept. of Pollution Control & Ecology  
P. O. Box 9583  
Little Rock, AR 72219

Bureau of Land Management  
411 Briarwood Dr., Suite 404  
Jackson, MS 39206

Regional Administrator  
Environmental Protection Agency  
1201 Elm Street  
Dallas, TX 75270

Federal Highway Administration  
Rm. 3128 Federal Bldg.  
700 W. Capitol Street  
Little Rock, AR 72201

District Engineer  
Corps of Engineers  
P. O. Box 867  
Little Rock, AR 72205

Mr. Lance Peacock  
The Nature Conservancy  
300 Spring Bldg., Suite 415  
Little Rock, AR 72201

Soil Conservation Service  
Federal Office Building  
700 W. Capitol St.  
Little Rock, AR 72201

Division of Endangered Species  
(Mail Stop 452 ARLSQ)  
U.S. Fish and Wildlife Service  
Washington, D.C. 20240

Office of Public Affairs  
(PA, 3447 MIB)  
U.S. Fish and Wildlife Service  
Washington, D.C. 20240

Division of Refuges  
(Mail Stop 670 ARLSQ)  
U.S. Fish and Wildlife Service  
Washington, D.C. 20240

Office of Research Support  
(RD-8/ORS, Mail Stop 725 ARLSQ)  
U.S. Fish and Wildlife Service  
Washington, D.C. 20240

Environmental Protection Agency  
Hazard Evaluation Division  
EEB (TS769C)  
401 M Street, S.W.  
Washington, D.C. 20460

Field Supervisor  
U.S. Fish and Wildlife Service  
Room 235, Thomas Bldg.  
900 Clay Street  
Vicksburg, MS 39180

Mr. Lawrence Mason  
Office of International Affairs  
(IA, Mail Stop 860 ARLSQ)  
U.S. Fish and Wildlife Service  
Washington, D.C. 20240

Ouachita National Forest  
P. O. Box 1270  
Hot Springs, AR 71902